PAT-NO: JP411296333A

DOCUMENT-IDENTIFIER: **JP 11296333 A**

TITLE: METHOD FOR DISTRIBUTING PRINT JOB

PUBN-DATE: October 29, 1999

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APPL-NO: JP11046517

APPL-DATE: February 24, 1999

INT-CL (IPC): G06F003/12 , B41J029/38

ABSTRACT:

   PROBLEM TO BE SOLVED: To increase a printing speed, and to reduce the
costs of hardware and maintenance by distributing a print job to plural
printers by a client computer.

   SOLUTION: In a print job distribution method, a print job 50 generated by
the application of a computer is divided into several small print job
segments 410, 420, and 430, and transmitted through a network to plural
network printers 20, 22, and 24. During a printing operation, a printer
inquiring part/printing lapse monitor 110 continues inquiry to a printer by
a state request 310, and obtains a printer state and a print job elapse
state report 460. Thus, the print job 50 can be decomposed again at the time
of the misoperation of a printer.
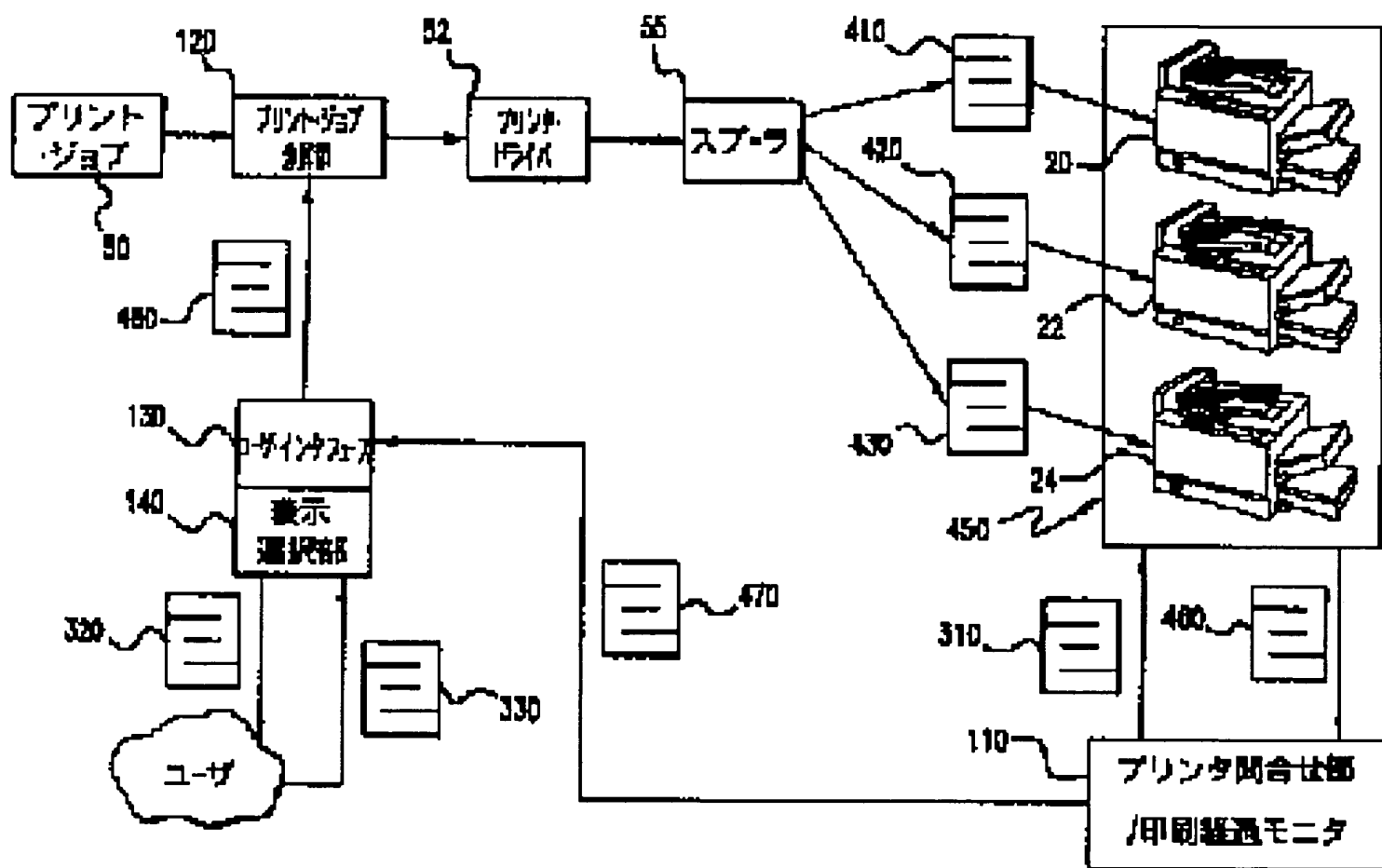
* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to control of two or more printers which can be set
on a computer network, and relates to the print job distribution approach between two or more
printers especially.
[0002]
[Description of the Prior Art] A computer is increasingly used in many fields of a life and work.
It is so important for them that a computer comes to be used more that data of each other can
be shared. In order to make a computer communicate mutually, generally a network is used. A
network connects a computer machine with means, such as a wire, a cable, the telephone line,
wireless, and light. However, all networks include the program (software) which enables the
communication link of a computer machine (hardware) and its device. The software program
which enables the communication link of hardware on a network is called network transport
(network transport). Generally it is called transmission to transmit a data file between two
equipments on a network. For example, the user of a computer "transmits" the file to print to
other computers which control a printer.
[0003] The network limited to a small number of computer in the local-area is called a local
area network (local area network), i.e., LAN. A large network is called a wide area network
(wide area network), i.e., WAN, rather than it spreads even on two or more buildings, cities,
and continents. The Internet is the example in which WAN was known most.
[0004] Things other than a computer are connected in the latest network. Now, peripheral
devices, such as a printer, mass storage system, and a communication device, serve as a
standard function. The computer connected to the network is called a network computer
(network computer), and the printer connected to the network is called a network printer
(network printer). In a network, a computer can be designed so that one human being may use
it at once, and it is called a single-user system (single user system). Generally, many single-
user systems are mutually connected by the network, and they use service of a large computer
rather than it is called a server. Memory capacity is large to a server and there are some which
carry out the work as data or a repository (repository) of a program in it. Such a server is called
a database server (database server) or a disk server (disk server). Moreover, there is also a
server which controls one or more printers and receives the data to print from a single user
computer. These kinds of servers are called a print server (print server). The network equipped
with the single-user system called the client (client) which operates with one or more servers is
called a client/server system as a whole. In such a system, a client uses the resource of other
computers (server), or service in the case of a data storage, a communication link, and
printing.
[0005] Many programs are performed within a client computer. It is called network transport to
these programs, and operates to them in the background, and there are a server and a thing

which communicates with other clients depending on the case in them. Moreover, there are also application and a called program intelligible for a user. There are for example, a WORD processing (word processing) program, a spreadsheet (spread sheet) program, and an electronic mail program in application. Most application programs can transmit the output to a printer. Print data are generated by actuation of an application program by the client side. When a user directs to print one character to a WORD processing program, a print job occurs in a client side (generated). A print job is generated by directing that even a simple operating system transmits an existing file to a printer. And a client computer transmits a print job to a print server through a network.

[0006] A print server is a common component which receives the print job which is connected to a network and transmitted from a client computer in many latest networks. A print server receives the print job generated in the client side, and makes the preparations sent to a printer. A print server is asked to a related printer and judges whether the printer is ready or the data which the printer prints are receivable. The inquiry to this printer by the print server is generated by direct connection between a network top or a print server, and a printer according to the class of connection. A printer answers by telling a print server about the condition of pair Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. There are many classes of printer conditions and there is a backlog (work backlog) of online/off-line, a mechanical failure, form plugging, the condition (consumable condition) that can be consumed, and an activity etc. Moreover, there is also the condition which shows the capacity of a printer like the option of monochrome pair color, a print speed, a paper size, and printer language (printer language). Once a print server identifies an usable printer to the job, it may process the addition about a print job, or may transmit it to a printer directly. Since additional processing adds the control instruction of a print job, they are all processings to ending generation of the raster image for printers. By the way, the above-mentioned raster image processing (raster image processing) is abbreviated to "RIP."

[0007] Cluster printing (cluster printing) is still more general as more nearly high-speed printing is needed. Cluster printing makes the whole print speed quick using two or more printers. Such improvement in the speed becomes possible by dividing or (dividing) decomposing a print job among two or more printers (parsing). For example, when one printer can print a 100-page job in 25 minutes, notionally, the same job can be printed in 5 minutes using five printers. There are some advantages in cluster printing. That is, as these advantages, it is making a job throughput (job throughput) into a high speed more by two or more printers, realizing printing with a fault tolerance with the redundancy (redundancy) of a printer, and that the consumption possibility (system expendability) of a system is acquired by adding a printer with the escape of a system. There are some which an one-set server electronic circuitry (sever electronics) commits as some print engines as an example of cluster printing. This electronics is needed for raster image processing (RIP). Moreover, there are also a print station or not only a marking engine but a RIP electronic circuitry and an example of cluster printing used repeatedly. In order to supply print data at the rate which satisfies the requirement of a print engine, an additional RIP processor is required for many complicated print jobs. One example of cluster printing is indicated by the U.S. Pat. No. 5,596,416 official report incorporated as reference into this description. There are some some which connect a print server to a printer logically through a network in the configuration of cluster printing, and there are some some which the thing between a print server and a printer style to be connected [direct] physical also has, and packed the print server and the printer in the same cabinet (cabinet) at the sacrifice of consumption possibility.

[0008]
[Problem(s) to be Solved by the Invention] By the way, a cluster printing method has the fault that a print server is required. Moreover, there is also a fault that the communication link of

dedication is required between a print server and a printer, therefore the location of a printer is restricted to a server.

[0009] A print server is a general purpose computer conventionally, also when using it within the context (context) of cluster printing, and also when that is not right. The special software only for tasks which controls one or more printers customizes a print server (customize). A network connects with a printer logically or such a server is physically connected through the path cord of dedication. The print facility in a network is decided by the availability of a print server. Any printings cannot be performed when the print server is not functioning. Furthermore, hardware and the cost of a maintenance will increase by adding a print server to a network.

[0010] This invention was made in view of the above-mentioned situation, and a client computer raises the rate of printing by communicating with two or more printers in a network top, and dividing a print job, and it aims at offering the print job distribution approach of holding down hardware and the cost of a maintenance.

[0011]
[Means for Solving the Problem] According to the desirable operation gestalt of this invention, the computer of dedication becomes unnecessary as a print server. Generally, the task about a print server is distributed by two or more client computers in the client/server system. According to this invention, a client computer can communicate with two or more printers in a network top, and a print job can be divided among some printers. By printing one print job by some printers, the rate of printing becomes quick and redundancy and the consumption possibility (expendability) accompanying reduction of required hardware can be acquired.

[0012] According to the approach by the desirable operation gestalt of this invention, without needing the print server of dedication, a network computer can decompose a print job and can transmit to one or more network printers. In this operation gestalt, the application on a computer generates a print job. The same computer divides or decomposes a print job into the smaller segment about each printer, and transmits the print job segment to each printer.

[0013] In other operation gestalten of this invention, a computer is asked to a network printer and displays the list of usable printers on the print job concerned to a user. With a certain operation gestalt, the subset (subset) which is the subset of some [usable] printers can be chosen without a user's input, and in other operation gestalten, while a user can read an usable printer and the list of functions, in order to receive the print job segment concerned, the subset of a printer is chosen. A computer supervises progress of the print job about each printer and it, after transmitting a print job segment to the selected printer. It may be a part of local area network which communicates with a printer directly logically, or it may connect with a wide area network temporarily, or computers may be a part of other network configuration of the common knowledge for this contractor in the technical field of a computer network.

[0014] In the desirable operation gestalt of this invention, the computer which communicates with two or more printers through a network is contained in hardware. The software program on a computer The print job generating section which generates a print job (print job originator), The printer inquiry section which judges the condition of a printer (print interrogator), The print job decomposition section which decomposes a print job into a print job segment about each printer (print job parser), And it consists of some bodies, such as network transport which transmits a print job segment to a printer through a network. There is a user interface which makes it possible to choose the printer by which the condition of a printer is connected to a user as a function of the arbitration of a software program, and a user receives a print job segment based on user criteria. Furthermore, there is a printing progress monitor (printer progress monitor) which notifies a user of the condition of a print job segment including job termination as a function of the arbitration of software.

[0015] Moreover, with still more nearly another operation gestalt of this invention, since it is in

an error or a form piece condition, when the original printer becomes unusable, a print job segment is again transmitted to other printers using the capacity which supervises a print segment. By this function, the redundancy that failure of 1 or two or more printers is compensated by other printers can be acquired. Furthermore, a print job can be divided into a smaller part and printing time amount can be made shorter than before as a new printer is added to a system and made usable.

[0016] One operation gestalt of this invention is realized by loading software from a program storage like CD-ROM or a network in which read-out of a computer is possible. The program asked to a printer, the program which notifies a condition, the program which divides a print job, and programs mentioned above, such as a program which displays an usable printer through a user interface as arbitration, and enables a user's selection, are included in this software. Moreover, the function of the addition which makes redundancy of a printer possible is also obtained by rearranging a print job segment.

[0017] Other descriptions and advantages of this invention become clear from detailed explanation of the following which performs the principle of this invention with reference to the accompanying drawing shown as an example.

[0018]

[Embodiment of the Invention] According to the desirable operation gestalt of this invention, the computer of dedication as a print server can become unnecessary, a print job can be divided into some printers, and a client computer can communicate with two or more printers on a network. By printing one print job by some printers, a print speed becomes quick and can acquire redundancy and the consumption possibility (expendability) accompanying reduction of required hardware. According to this invention, the problem about the conventional print server which is the custom-made processor of dedication of the general purpose computer equipped with the software of dedication or the task which controls one or more printers is solved. That is, the print facility by the conventional network print server is influenced by the availability of one or more print servers. While these print servers are not functioning, printing by them cannot be performed at all. Furthermore, according to this invention, in much application, the additional cost and the maintenance by making the conventional print server unnecessary and making a print server separate can be reduced.

[0019] In the network where a computer and a printer are existing, the desirable operation gestalt of this invention is a printer driver arranged on a client computer. The conventional print server can be deleted in much network topology (topology). By dividing one print job into two or more print job segments distributed by some printers, time amount required since a print job is completed can be shortened. Thereby, the user who uses this invention can acquire the following advantages. That is, they are the redundancy by using improvement in the speed of the print job termination by operating some printers simultaneously, and two or more printers, and the consumption possibility by making the number of network printers increase easily.

[0020] This invention is realizable in the network topology shown in drawing 1 . Drawing 1 is drawing showing two or more computers logically connected to two or more printers by the network. Network computers 10, 12, 14, and 16 are connected to the network printers 20, 22, and 24 through the network 30. Actually, a network may be a local area network (LAN), a wide area network (WAN), or a hybrid network (hybrid network). About how a network is realized, it is not important in this invention. As an example of network connection, there are a twisted pair wire (twisted wire pairs), a coaxial cable, an infrared light beam, the telephone line, a radio frequency (RF and radio frequency) link, etc. In drawing 1 , altogether, the network computer and the network printer are combined logically or physically so that it can communicate through a network 30. As a correspondence procedure on a network, many formats can be taken like the network itself. There are TCP/IP, a token ring, etc. in the example of network communication.

[0021] according to the desirable operation gestalt of this invention – any of network computers 10-16 – although – on the occasion of printing, a print job segment can be transmitted to the network printers 20-24. For example, the application under activation presupposes that the print job which is 60 pages was generated by the network computer 12. In this invention, although actual application is not important, it has a word processor, a spreadsheet, a graphic program, and a simple print file operation as general application. A network computer 12 performs an inquiry to the network printers 20-24, and judges about those usabiilty.

[0022] When usable to printing, as for a network computer 12, three network printers 20-24 decompose a 60-page print job into three 20-page print job segments, and it is made to become one segment about each of three network printers 20-24 altogether. And a network computer 12 transmits a 20-page print job segment to each printer. Thereby, printing time amount can be shortened also 3 times rather than it makes one printer print 60 pages. one [22] of the printers, for example, a printer, – business – for the reasons of the backlog of a paper jam, the lack of a form, and a print job etc., when unusable, the print job segment from a network computer 12 is transmitted to the remaining network printers 20 and 24. By being decomposed to the network printers 20 and 24, the print job from a computer 12 serves as a 30-page print segment about two printers of each, and can be made into the time amount of the one half of the printing time amount only by one printer. Furthermore, when other printers (not shown) are added to a network, print job time amount can be shortened further and redundancy and flexibility can be increased.

[0023] You may make it the decomposition to the print job segment of a print job decided by the rate of each printer as other operation gestalten. For example, when the network printer 20 is more nearly high-speed than the network printers 22 and 24, since the network printer 20 can print many within predetermined time amount from the network printer 22 or 24, it transmits a larger print job segment to the network printer 20.

[0024] The publication mentioned above explained the concept of dividing a print job into a computer and many computers in the network of a printer. In the following publications, actuation of a software component (component) and more detailed explanation of operation are given.

[0025] Drawing 2 is the block diagram showing the program used by computer shown in drawing 1 . The application program under activation generates a simple text, a complicated image, the raster display of a dot, or the print job 50 of one of many the possible printer control languages (printer control language) on a network computer. The general network computer has a printer driver 52, a spooler (spooler) 55, and each program called the network transport 150. By these programs, the print job 50 can be transmitted to a network printer through a network 160. The program of some additions is used in this invention. That is, it is the printer inquiry section and the printing progress monitor (the printer inquiry section / printing progress monitor) 110, the print job decomposition section (print job parser) 120, a user interface 130, and the display selection section (display select) 140, and these are collectively called the print job processor 100. These programs are connected by the program link 60 in some locations, and are the programs of a network computer.

[0026] The program of this invention is independently indicated to be the network transport 150 with the printer driver 52 and the spooler 55, in order to clarify. Probably, for this contractor of a printer driver, a spooler, and the technical field about network transport, it will be clear that the program of this invention can be included as a part of printer driver, spooler, or network transport.

[0027] Thus, by including the program of this invention, a user can control cluster printing by the interface of a printer driver like a dialog box. For example, the selection by the user of the printer or criteria that the user was chosen about automatic cluster printing may be controlled

through a printing dialog box common to the operating system service of most network computers.

[0028] In drawing 2 , as the print job 50 goes to a printer driver 52, it is incorporated by one of the links 60 at the print job processor 100. Within the print job processor 100, the printer inquiry section / printing progress monitor (it is henceforth called the "printer inquiry section".) 110 operates through the network transport 150, asks the printer on a network, and judges the condition of each printer. Since it is ready for receiving a print job at this time, there is an usable printer, and there is a printer which cannot be used for many reasons of the incompatibility of failure, a print job backlog, or a medium etc. The printer inquiry section 110 creates the list of usable printers as a result of an inquiry process. A user interface 130 reports an usable printer and a printer condition to a user. The display selection section 140 displays the above-mentioned condition on a user, and enables it to choose the network printer by which a user receives the segment of a print job. Thus, a user can choose a subset from the list of usable printers, in order to create the list of printers chosen so that the segment of a print job might be received. The criteria used for a user choosing a subset change by to what a user gives priority. Although a user has priority, there are the location and printing quality of a printer as an example. It is arbitrary to use a user interface 130, in order to choose the subset of an usable printer. With other operation gestalten of this invention, in order that a system administrator or a user may receive a print job segment based on the predetermined criteria set up beforehand, the subset of an usable printer is created. Once the subset of an usable printer is determined, the print job decomposition section 120 will decompose the original print job into a print job segment to each of the selected printer. The print job decomposition section 120 passes a print job segment to the printer drive 52 through a link 60. And a printer driver 52 transmits a print job segment to each selected printer through a spooler 55 and the network transport 150. By the program link 60, the program of this invention can control and supervise progress of a print job segment. After being transmitted to the printer by which the print job segment was chosen, the printer inquiry section 110 continues the monitor of a printer condition. By checking a printer condition through the network transport 150, the printer inquiry section 110 judges whether all print job segments are printed appropriately. For example, when the network printer 22 (refer to drawing 1) becomes unusable according to a form piece condition, to the print job decomposition section 120, the printer inquiry section 110 decomposes the original print job again, and orders to cancel the part by which the print job segment first transmitted to the network printer 22 is not printed. This part in which printing by the printer 22 was planned at the beginning is canceled by the network printer 22, and is again transmitted to other printers of the selected printers.

[0029] Drawing 3 is a flow chart which shows actuation of the program shown in drawing 2 . First, a print job is generated on a computer (block 300). The printer inquiry section judges the condition of the printer on a network (block 310). Thus, from the judged condition, the printer inquiry section creates the list of usable printers, and as shown in block 320, it displays it on arbitration to a user. As processing of arbitration, through the program step of block 330, a user considers the list of this usable printer in a detail, chooses a printer from this list, and creates the subset of a printer. The design of such a user interface is common knowledge for this contractor in the technical field of a graphical user interface design. In the block 340, the system of the program which constitutes the print job processor 100 has the list of printers of the point which transmits a print job and its print job. Here, the print job decomposition section 340 uses two or more criteria, and a print job is decomposed to the selected printer (block 340). Although the above-mentioned criteria change with systems, as an example of criteria, there are a print speed, printing quality, a physical location of a printer, color capacity of a printer, a print job backlog, and form handling capacity. In block 330, the print job decomposition section generates a print job segment by the system configuration or the user

input based on the printing quality or the content of a color over the done print based on the print speed about the print job of a draft (draft). Since it may spread on a continent depending on a computer network, as for the physical location of a printer, only a local copy is important for a required user. Moreover, a user may specify printing of a certain copy to the printer in other office of a different town or a country. In block 340, after dividing the print job decomposition section into a printer job segment to the printers of each which had the original print job chosen, it transmits a print job segment to each of the selected printer. During printing of a print job segment, the print job inquiry section checks progress of the print job segment in each printer by asking those printers in block 350. When the condition of being returned from a printer shows that all the print job segments were printed safely, it judges that the job was completed in the block 360 of decision, and processing is ended. When it is difficult for one or more printers to print the assigned print job segment, the list of printers chosen from the block 370 of decision by progressing to block 380 is corrected, the print job segment of the printer which it is with obstacles and did not operate in the block 390 is decomposed again, and it is transmitted to other printers. And in block 350, the inquiry of a printer is continued until all print job segments are printed. After all print job segments are completed, termination is notified by the user interface to a user.

[0030] Drawing 4 is drawing which summarized the program shown in drawing 2 , and its actuation. The application program under activation generates the print job 50 on a client computer. The printer inquiry section 110 performs an inquiry to the network printer 450 by the condition demand 310 for judging the condition of the printer on a network. The network printer 450 returns the status report 460 including progress of a current print job. Thus, from the condition returned, the printer inquiry section 110 creates the list 470 of usable printers passed to a user interface 130. A user interface 130 passes the list of usable printers to the display selection section 140 which displays the list 320 of usable printers to a user. A user creates the alternative 330 of a printer from the list of usable printers, and returns this to the display selection section 140. The subset 480 of the usable printer generated as a result is passed to the print job decomposition section 120 by the user interface 130. The print job decomposition section 120 uses this subset 480, and forms the print job segment 410,420,430. And the print job decomposition section 120 transmits the print job segment 410,420,430 through a printer driver 52, a spooler 55, and network transport (not shown) to the network printers 20, 22, and 24 currently mentioned to the subset 480 of an usable printer. As mentioned above, the criteria for print job decomposition change.

[0031] There are the die length and the number of copies which are contained in the print job itself in the further factor which influences print job decomposition. For example, it is most suitable for the print job of copying the 60 sections of 10-page things to use a 10-page thing as three print job segments called 20 section copy, and to be decomposed to three printers. On the contrary, it is most suitable to be decomposed as three print job segments by which the single print job of one 600-page document was divided into 600 pages from 1 page to 200 pages, 201 pages to 400 pages, and 401 pages. As arbitration, with the instruction for collating a print job segment manually, the print job decomposition section 120 can generate a print job classification sheet, and can constitute the output bottle (output bin) of a printer. During printing actuation, the printer inquiry section 110 continues an inquiry to a printer by the condition demand 310, and acquires the status report 460 of a printer condition and print job progress. Thereby, the print job processor 100 can decompose the print job 50 again at the time of malfunction of a printer.

[0032] Since it mentioned above, a user can acquire a more nearly high-speed print speed, the redundancy of a printer, and the easy approach of adding all printers by printer control by this invention, without needing the print server of dedication.

[0033] Although explained and illustrated about some characteristic operation gestalten of this

invention, this invention is not limited to arrangement of a specific format or components which were explained and illustrated above, and is limited by only the claim.

[0034] The gestalt of operation of this invention is summarized below.

1. A network computer (10, 12, 14, 16) performs. It is the approach of making two or more network printers (20, 22, 24) distributing the print job (50) from this network computer (10, 12, 14, 16). a. The step which generates said print job (50) (300), b. The step which decomposes said print job (50) into two or more print job segments (410,420,430) (340), c. The print job distribution approach of having the step (340) which transmits said print job segment (410,420,430) to said two or more network printers (20, 22, 24,450).

[0035] 2. Print job distribution approach given in the above 1 which has further step (460) which reports condition of said network printer (20, 22, 24).

[0036] 3. Print job distribution approach given in the above 1 which has further step (110,350) which supervises progress of said print job segment (410,420,430).

[0037] 4. Print job distribution approach given in the above 1 which has further step which asks said network printer (20, 22, 24,450) (110,350), and creates list (470) of usable printers.

[0038] 5. Print job distribution approach given in the above 4 which has further step which creates subset (480) of printer for receiving said print job segment (410,420,430) from list (470) of said usable printers.

[0039] 6. Print job distribution approach given in the above 4 which has further step (330) which chooses printer (480) which receives said print job segment (410,420,430), and which is chosen from list (470) of said usable printers.

[0040] It is Equipment Which Distributes Print Job (50). 7. A. Network (160), b. Two or more printers connected to said network (160) (20, 22, 24,450), c. Connect with said network (160) and it has the computer (10, 12, 14, 16) which communicates with said two or more printers (20, 22, 24,450). Said computer (10, 12, 14, 16) i. The print (300) job generation section which generates said print job (50) (300), The printer inquiry section which judges the condition (460) of the printer (20, 22, 24,450) of the ii. aforementioned plurality (110), The print (340) job decomposition section which decomposes the iii. aforementioned print job (50) into two or more print job segments (410,420,430) (120), The print job cracking unit which has the network transport (150) which transmits the print job segment (410,420,430) of the iv. aforementioned plurality to said two or more printers (20, 22, 24,450) through said network (160).

[0041] 8. Said computer (10, 12, 14, 16) is a print job cracking unit given in the above 7 which reports the condition (460) of two or more of said printers (20, 22, 24,450), and has further the user interface (130) which makes possible what (330) the printer which receives said two or more print job segments (410,420,430) further is chosen from said two or more printers (20, 22, 24,450) for.

[0042] 9. Said computer (10, 12, 14, 16) is a print job cracking unit given in the above 7 which has further the printing (350) progress monitor (110) which supervises progress of said print job segment (410,420,430) in said two or more printers (20, 22, 24,450).

[0043] 10. Said Network Computer (10, 12, 14, 16) Performs. In order to perform the step of the approach of making two or more network printers (20, 22, 24,450) distributing the print job (50) from a network computer (10, 12, 14, 16) It is the program storage which the computer which materializes actually the program of the instruction which can be executed by said computer (10, 12, 14, 16) can read. The step to which the method of distributing said print job generates the a. aforementioned print job (50) (300), b. The step which decomposes said print job (50) into two or more print job segments (410,420,430) (340), c. Program storage which has the step (240) which transmits said print job segment (410,420,430) to said two or more network printers (20, 22, 24,450).

[0044]

[Effect of the Invention] Since this invention is constituted as explained in full detail above, according to the desirable operation gestalt of this invention, it becomes unnecessary [a computer as a print server which needs the communication link of dedication between printers].

[0045] Moreover, a client computer can communicate with two or more printers in a network top, and a print job can be divided among some printers. By this, one print job can be printed by some printers, the rate of printing can become quick, redundancy can improve, and the consumption possibility accompanying reduction of required hardware can be acquired.

[Translation done.]